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A computational efficient blind deconvolution algorithm has been developed which recovers an information bearing signal that has been distorted by transmission through an unknown system. In the array processing problem, a target detection and location algorithm which provides quality estimates in the presence of impulsive type noise has been developed. Its performance significantly improves upon existing algorithms. The blind deconvolution algorithm is based on a kurtosis analysis of the measurement data. The innovative aspect of this analysis results in one having to solve a fixed point problem. A computation efficient algorithm for solving this fixed point problem has been developed. Numerical experimentation has shown that the proposed blind deconvolution algorithm provides for a more effective deconvolution operation in comparison to existing techniques. In many target detection and location problems, the array's sensor signals are corrupted by impulsive-type noise which causes most existing direction-of-arrival algorithms to either fail or to provide unacceptably poor performance. To overcome this, a modification of the author's signal subspace DOA algorithm has been made. This algorithm is useful for general array geometries and is applicable to applications in which the incident sources are incoherent, coherent, or a mixture of incoherent and coherent sources.

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SUPER-RESOLUTION TARGET DETECTION AND TRACKING

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Abstract

During the past year our research group has made significant progress in the areas of (i) blind deconvolution, and, (ii) target detection and location in the presence of impulse type noise (or data outliers). A computational efficient blind deconvolution algorithm has been developed which recovers an information bearing signal that has been distorted by transmission through an unknown system. This data corruption might correspond to the distortion introduced by passage of the signal through a medium or it might arise from the dynamics of measurement instrumentation. In the array processing problem, a target detection and location algorithm which provides quality estimates in the presence of impulsive type noise has been developed. Its performance significantly improves upon existing algorithms.

Since the deconvolution problem is inherent in many scientific tasks, it is essential that a viable means for obtaining a practical solution be available. The blind deconvolution algorithm developed by the author is based on a *kurtosis* analysis of the measurement data. The innovative aspect of this analysis results in one having to solve a fixed point problem. A computational efficient algorithm for solving this fixed point problem has been developed. Numerical experimentation has shown that the proposed blind deconvolution algorithm provides for a more effective deconvolution operation in comparison to existing techniques.

In many target detection and location problems, the array's sensor signals are corrupted by impulsive-type noise which causes most existing direction-of-arrival (DOA) algorithms to either fail or to provide unacceptably poor performance. To overcome this serious defect, a modification of the author's *signal subspace* DOA algorithm has been made. It involves using a non-quadratic performance criterion that effectively mitigates the effects of the data outliers. Numerical examples have demonstrated the relative effectiveness of the proposed algorithm. This algorithm is useful for general array geometries and is applicable to applications in which the incident sources are incoherent, coherent, or a mixture of incoherent and coherent sources.

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